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The relationship betwee n a composite of student entry characteristics--unit pretest score, number of skills to be mastered in the unit, the student's intelligence quotient and age, units previously mastered--and the amount of time required to complete one of four units of D or E level mathematics was investigated. Beta weights for the regression equations associated with eight samples of student performance were computed. Results of the study indicated that the number of days required to master a given unit was related to the student's initial entering state; the most important factors being the student's unit pretest score, the number of skills that must be mastered, and the student's age. (Author/GO)

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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN SELECTED STUDENT CHARACTERISTICS AND TIME REQUIRED TO ACHIEVE UNIT MASTERY

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AN INVESTIGATION OF THE RELATIONSHIP BETWEEN SELECTED STUDENT ENTERING CHARACTERISTICS AND TIME REQUIRED TO ACHIEVE UNIT MASTERY[1]

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Abstract

The relationship between a composite of student entry characteristics and the amount of time required to complete one of four units of D or E level mathematics was investigated. This examination included the intercorrelations between the criterion and the five variables: (1) unit pretest score, (2) number of skills to be mastered in the unit, (3) student's intelligence quotient, (4) student's chronological age, and (5) total units previously mastered. Beta weights for the regression equations associated with 8 samples of student performance were computed. Results of the study indicated that the number of days required to master a given unit was related to the student's initial entering state with the most important factors being the student's unit pretest score, number of skills to master and the student's age.

Background and Purpose

Over the past few years a series of studies (Yeager, 1966; Yeager & Lindvall, 1967; Wang, 1968) has been conducted examining various types of learning rate measures and the relationship between these rate measures and selected student characteristics. Essentially all of these studies have failed to evidence any relationship between selected student characteristics such as intelligence, reading or mathematics achievement, attitude toward mathematics, attitude towards a particular task, age, and various measures of rate of learning under the system of Individually Prescribed Instruction (Glaser, 1968; Lindvall & Bolvin, 1967).

This study attempts a further exploration of rate of learning by examining the relationship of the number of days required by a student

to complete a given unit of mathematics to a composite of student entering characteristics of which the teacher would be cognizant at the time of preparing a prescription. This avenue of investigation would seem to be more fruitful than simply studying singular relationships since the prescription is the central controlling mechanism in determining the length of time a student is required to work in a given unit. It is the hypothesis of this study that there exists a significant positive relationship between the student's initial state before beginning work on a given task and the amount of time required to complete the task.

The student's initial entry state can be assessed on the basis of five student characteristics that the teacher would have at his disposal before writing the prescription. (1) The first characteristic is that of the unit pretest score which is provided in terms of a percentage of correct responses. If the unit pretest score is subtracted from 100 (the maximum criterion for the unit test) the teacher has information as to the amount of learning that must be accomplished before the student has evidenced mastery of the unit. This percentage score can be conceptualized as the distance the student must cover before he has successfully completed the unit. (2) The second type of information that is available is the number and kind of skills that comprise this distance between pretest score and mastery. Under IPI each student concentrates on only those skills for which he has not demonstrated the required degree of proficiency. Thus, it is important to distinguish between a student who must work on several skills and one who must work on only one or two skills to complete the unit. In addition, each skill requires a somewhat different type of behavior, and it is necessary that the teacher know the number of behaviors involved through an analysis of the student's performance on the unit pretest. (3) Another type of information that the teacher has at the time of preparing the prescription is that of the relative ability of the

student. Although the teacher may not have the student's exact intelligence quotient, it can be assumed that she does have some general knowledge concerning the student's intellectual capabilities. (4) A fourth factor of which the teacher is aware is the relative age of the student. Age in this case may be considered a measure of the student's maturity, which could effect the amount of time required to complete a given task. (5) The fifth type of information readily available to the teacher is the total number of units previously mastered by the student, which in effect summarizes the student's mathematical skills and his present level of achievement. Therefore, before writing the prescription, the teacher subjectively considers all these factors in combination in order to prepare a prescription that is uniquely suited to the needs of the student.

Method

Based on the logical generalizations which a teacher might make in developing a student's prescription, data were collected on the five student variables: (1) unit pretest score, (2) number of skills to be mastered in the unit, (3) student's intelligence quotient, (4) student's chronological age, and (5) total units previously mastered. These five independent variables were chosen to represent a composite of the student's entering behavior. The number of days needed to master the unit was then selected to be used as the dependent variable or criterion measure.

Eight samples of pupil performance from the Oakleaf School were studied during the school year of 1966-67. These samples were taken from the units of addition, subtraction, multiplication, and division at the D and E levels of the mathematics program. The means and standard deviations for each of the variables are reported in Table 1.

Utilizing the data collected, a correlation matrix was computed for each of the samples, Tables 2 - 9. From these matrices it was

Table 1
Means and Standard Deviations

Unit	Level	Number of Students	Unit Pre-test Score		Number of Skills to Master		I.Q.		Age in months		Total Units Previously Mastered		Days to Master Unit	
			M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
1 Addition	D	39	65.7	14.5	3.7	1.2	114.6	11.1	108.5	11.2	12.0	3.1	17.2	12.7
2 Subtraction	D	69	52.1	20.1	3.0	0.9	112.9	10.6	114.6	13.2	13.0	3.3	23.9	19.9
3 Multiplication	D	54	73.5	13.6	3.6	1.6	111.2	11.0	115.6	12.4	12.8	2.9	7.9	6.6
4 Division	D	69	70.1	15.5	3.5	1.5	112.5	10.2	118.3	13.3	13.1	3.5	9.4	7.0
5 Addition	E	41	79.1	7.5	2.2	1.2	115.2	11.2	125.4	10.6	14.0	3.2	8.6	6.0
6 Subtraction	E	49	66.9	16.2	2.4	0.8	118.0	10.7	123.9	13.7	14.2	3.4	11.2	10.9
7 Multiplication	E	50	68.2	14.7	5.0	2.1	119.3	8.9	126.7	12.2	15.0	3.8	21.9	14.9
8 Division	E	36	55.3	23.0	4.0	1.7	119.6	8.8	126.2	12.0	15.0	4.0	16.8	9.4

possible to examine the product-moment correlations of each of the variables. The last column computed in the correlation matrix gives the intercorrelation between each of the predictor variables and the number of days needed for unit mastery. These intercorrelations demonstrate the relative dependence of the criterion on each of the five factors.

Each of these matrices was then examined in detail and a comparison made between the two levels of achievement (D and E) for each of the mathematical processes. Since our main interest concerned the relationship of the criterion to the other variables, the following discussion is limited to the last column of the correlation matrix.

Results

Tables 2 and 3 show the correlation matrices for the D and E levels of addition. Comparing these units with one another, a consistent pattern was not found for the intercorrelations of the number of days spent mastering a unit (column 6) with the other five variables. At the E level, there was a negative correlation for the unit pretest score and a positive one for the skills to be mastered with the criterion. These findings were consistent with those at D level. These high intercorrelations indicated that these two variables were probably the strongest factors which influenced the criterion of the E unit. Age at the D level also had a high intercorrelation and played a greater part in determining the number of days for mastery of skills at the D level than at the E level. In neither of these units was there a high intercorrelation between I.Q. and the criterion. This appeared to indicate that as long as the student was capable of mastery at some time, I.Q. had little influence on the amount of time needed to complete the unit.

Table 2
Predictor and Criterion Variable Intercorrelation
Matrix: D Level Addition

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.510	-.111	.187	-.320	-.342
2 Skills to Master	-.510	1.000	-.129	-.112	.254	.486
3 I.Q.	-.111	-.129	1.000	.015	.186	.069
4 Age	.187	-.112	.015	1.000	-.675	-.528
5 Total Units Previously Mastered	-.320	.254	.186	-.675	1.000	.329
6 Days to Master	-.342	.486	.069	-.528	.329	1.000

(39 subjects)

Table 3
Predictor and Criterion Variable Intercorrelation
Matrix: E Level Addition

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.400	.152	.444	.452	-.673
2 Skills to Master	-.400	1.000	-.233	-.082	-.106	.685
3 I.Q.	.152	-.233	1.000	-.002	-.010	-.169
4 Age	.444	-.082	-.002	1.000	.475	-.287
5 Total Units Previously Mastered	.452	-.106	-.010	.475	1.000	-.388
6 Days to Master	-.673	.685	-.169	-.287	-.388	1.000

(41 subjects)

A general comparison of the correlation matrices of the D and E level subtraction units in Tables 4 and 5 showed that each of the predictor variables correlated approximately the same relative amount with the days spent in mastering the unit. The three main determining factors for both of the units were the unit pretest score, the number of skills to be mastered, and the age of the student. Since the two variables, I. Q. and the total number of units previously mastered, had low intercorrelations with the criterion, it was assumed that the number of days needed for mastery was not highly dependent upon these factors.

Inspection of the correlation matrices in Tables 6 and 7 for the D and E levels of multiplication indicated that the criterion for these units was highly dependent upon the unit pretest score, the skills to be mastered, and the age of the student. These variables produced the highest intercorrelations with the dependent variable, the number of days needed to master the unit. The variable I. Q. appeared to have had more influence on the mastery of multiplication at the D level than at the E level, while the number of skills previously mastered had approximately the same relative influence at both levels.

An examination of the last column of the division units in Tables 8 and 9 showed that the predictor variables had approximately the same correlations with the required time to master the units. Correlations were the highest with the unit pretest score and the number of skills to be mastered, indicating that the criterion of these units was more dependent upon these variables than upon the remaining three variables which had lower correlations. Since I. Q. had one of the lowest intercorrelations, it was assumed that it had the least influence on the time required for unit study.

Considering the overall picture of the correlation matrices for all units, it was found that there were consistently high correlations between the days required to master a unit and the two variables, unit pretest score and the number of skills to be mastered, with the age of the student

Table 4
Predictor and Criterion Variable Intercorrelation
Matrix: D Level Subtraction

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.645	.023	.070	.072	-.426
2 Skills to Master	-.645	1.000	-.075	-.261	-.110	.431
3 I.Q.	.023	-.075	1.000	-.275	.118	.174
4 Age	.070	-.261	-.275	1.000	-.089	-.514
5 Total Units Previously Mastered	.072	-.110	.118	-.089	1.000	.055
6 Days to Master	-.426	.431	.174	-.514	.055	1.000

(69 subjects)

Table 5
Predictor and Criterion Variable Intercorrelation
Matrix: E Level Subtraction

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.597	.120	.373	.266	-.582
2 Skills to Master	-.597	1.000	.142	-.232	-.317	.513
3 I.Q.	.120	.142	1.000	-.187	.064	.081
4 Age	.373	-.232	-.187	1.000	.136	-.401
5 Total Units Previously Mastered	.266	-.317	.064	.136	1.000	-.181
6 Days to Master	-.582	.513	.081	-.401	-.181	1.000

(49 subjects)

Table 6
Predictor and Criterion Variable Intercorrelation
Matrix: D Level Multiplication

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.597	-.073	.190	-.187	-.510
2 Skills to Master	-.597	1.000	.038	-.414	.229	.716
3 I.Q.	-.073	.038	1.000	-.246	.095	.377
4 Age	.190	-.414	-.246	1.000	-.269	-.486
5 Total Units Previously Mastered	-.187	.229	.095	-.269	1.000	.344
6 Days to Master	-.510	.716	.377	-.486	.344	1.000

(54 subjects)

Table 7
Predictor and Criterion Variable Intercorrelation
Matrix: E Level Multiplication

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.570	-.140	.417	.391	-.690
2 Skills to Master	-.570	1.000	.110	-.367	-.285	.604
3 I.Q.	-.140	.110	1.000	-.127	-.181	.158
4 Age	.417	-.367	-.127	1.000	.192	-.609
5 Total Units Previously Mastered	.391	-.285	-.181	.192	1.000	-.333
6 Days to Master	-.690	.604	.158	-.609	-.333	1.000

(50 subjects)

Table 8
Predictor and Criterion Variable Intercorrelation
Matrix: D Level Division

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.742	.222	.227	.210	-.768
2 Skills to Master	-.742	1.000	-.083	-.306	-.087	.711
3 I.Q.	.222	-.083	1.000	-.133	.090	-.164
4 Age	.227	-.306	-.133	1.000	-.002	-.331
5 Total Units Previously Mastered	.210	-.087	.090	-.002	1.000	-.122
6 Days to Master	-.768	.711	-.164	-.331	-.122	1.000

(69 subjects)

Table 9
Predictor and Criterion Variable Intercorrelation
Matrix: E Level Division

	Unit Pretest Score	No. of Skills to Master	I.Q.	Age	Total Units Previously Mastered	Days to Master
ROW	1	2	3	4	5	6
1 Pretest	1.000	-.807	.038	.444	.441	-.783
2 Skills to Master	-.807	1.000	-.096	-.298	-.161	.812
3 I.Q.	.038	-.096	1.000	-.058	-.225	-.074
4 Age	.444	-.298	-.058	1.000	.147	-.295
5 Total Units Previously Mastered	.441	-.161	-.225	.147	1.000	-.288
6 Days to Master	-.783	.812	-.074	-.295	-.288	1.000

(36 subjects)

being the next most consistent factor. Table 10 shows the consistency that existed across all eight units of work. These three variables influenced the outcome of the criterion to a greater degree than did the variables of I. Q. and the number of units previously mastered. The negative correlations for unit pretest score and age in all of the units were interpreted to mean that if a student had a low unit pretest score or if he was younger than the average student of the population, we expected him to take a longer time mastering these units. A positive sign associated with the number of skills to be mastered variable indicated the greater the number of skills to be mastered the longer it took to complete the unit.

Surprisingly, the total number of units previously mastered did not show a consistent effect, for in some of the units it was positive and in others, negative.[2] Also, in all of the units the days required to master had a very low correlation with mental ability and was found to be both negative and positive. It appeared, therefore, that I. Q. was not a strong determinent for days needed to master a unit. Both of these findings were consistent with previous research findings (Yeager, 1966; Yeager & Lindvall, 1967; Wang, 1968).

Using the intercorrelations of the correlation matrices, it was then possible to compute multiple regression equations for each of the eight samples. The following regression equation gives the criterion in standard form:

$$Z = BZ_1 + BZ_2 + BZ_3 + BZ_4 + BZ_5$$

Where: Z = Number of days to master unit

Z_1 = Unit pretest score

Z_2 = Number of skills to be mastered

Z_3 = I. Q.

Z_4 = Chronological age in months

Z_5 = Total number of units previously mastered

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[2] It would be anticipated that the total number of units mastered would represent a fairly stable reference measure in that it represents the achievement of the student on an assumed hierarchy of skills.

Table 10
Correlation Unit Pretest Score, Skills to Master
and Age with Days to Complete Unit

Unit	Level	Unit Pretest Score	Skills to Master	Age
Addition	D	-.342	.486	-.528
Subtraction	D	-.426	.431	-.514
Multiplication	D	-.510	.716	-.486
Division	D	-.768	.711	-.331
Addition	E	-.673	.685	-.287
Subtraction	E	-.582	.513	-.401
Multiplication	E	-.690	.604	-.609
Division	E	-.783	.812	-.295

Table 11
Beta Weights

Unit	Level	Unit Pretest Score	No. of Skills	IQ	Age	Total Units Pre-Mastered
Addition	D	-.04	.49	.19	-.67	-.29
Subtraction	D	-.32	.12	.06	-.44	.04
Multiplication	D	-.11	.56	.31	-.12	.13
Division	D	-.52	.28	-.04	-.13	.02
Addition	E	-.40	.51	.01	.01	-.16
Subtraction	E	-.38	.24	.05	-.20	.02
Multiplication	E	-.39	.24	.03	-.35	-.04
Division	E	-.32	.54	-.02	.02	-.07

The beta coefficients of the regression equations for the samples are given in Table 11. In examining the beta weights, it can be seen that all of the unit pretest score betas were negative. This was expected since the lower the student's unit pretest score, the longer it would take him to master the unit. Although these beta coefficients were all negative, the range of values indicated that they were not of equal importance. Looking at the beta coefficients for the number of skills needed to master a particular unit, it can be seen that all of the weights were positive. It then followed that the greater the number of skills to be mastered in a unit, the longer the time needed to master the unit. An inspection of the IQ beta coefficients showed that only two were of any importance in relation to the criterion of the unit. But even these beta weights were considered of only secondary importance in their respective regression equations. Age, which is the fourth factor to be considered, had both extremely high negative coefficients and low positive coefficients which indicated that younger students needed more time to attain mastery, although only those regression equations with high negative weights were highly dependent upon age. A study of the beta weights for total units previously mastered showed that both positive and negative coefficients were computed. However, even the largest weights of this factor were of only minor importance in their respective regression equations in relation to the criterion of the unit.

Since beta weights were applicable only to specific regression equations, no generalizations concerning the importance of the factors were made. Because of the limitations of the beta weights, a partial r was computed to determine if a relationship exists between IQ and the correlation of the two variables, the number of skills to master and the days to master the unit, while IQ was held constant. Table 12 shows the results.

From the data presented, IQ did not appear to have an effect upon the correlation between the variables, the number of skills to master and

Table 12
Correlation Between the Number of Skills
to Master and the Days to Master the Unit

		With IQ Held Constant
D Level Addition	.49	.50
D Level Subtraction	.43	.45
D Level Multiplication	.72	.76
D Level Division	.71	.71
E Level Addition	.69	.67
E Level Subtraction	.51	.51
E Level Multiplication	.60	.60
E Level Division	.81	.81

Table 13
Correlation Between the Number of Skills
to Master and the Days to Master the Unit

		With Age Held Constant
D Level Addition	.49	.51
D Level Subtraction	.43	.36
D Level Multiplication	.72	.65
D Level Division	.71	.68
E Level Addition	.69	.69
E Level Subtraction	.51	.47
E Level Multiplication	.60	.52
E Level Division	.81	.79

the days to master the unit, among the samples studied. As IQ was eliminated, four of the units showed no measurable change and only three of the units showed a slight tendency to increase the correlation between the two variables considered. The correlation of these factors was evidently not significantly dependent upon IQ.

A survey of the units revealed that the correlations between the number of skills to master and the days to master the unit were all positive and ranged from .43 to .81. To determine the dependency of these factors upon age, a partial r was computed for the two variables while age was held constant. The results are presented in Table 13.

As can be seen from Table 13, among the samples tested, the correlation between the two variables showed only a slight or no apparent change. Although the direction of change for six of the units indicated that the number of skills to master and the days to master the unit are dependent upon age, the size of the decrease was negligible.

Along with computing beta weights, multiple R's were computed for each of the sample populations. These are summarized in Table 14. Multiple R is the maximum correlation between the number of days required to master a unit and a weighted combination of the other five variables. All of the multiple R's were found to be significant at the .01 level when the F test was computed. Therefore, the null hypothesis that there is no relationship between the student's entering state and his rate of learning can be rejected. Table 14 summarizes the F test results for all the units. The superscript 5 accounts for the five degrees of freedom associated with the variable and the subscript refers to the degrees of freedom determined by the sample size. A high multiple R was computed for multiplication and division at both levels of difficulty while the E level of addition had a higher multiple R than level D. Both of the subtraction units yielded the lowest multiple R's computed.

Table 14
Multiple R

No.	Unit	Level	Multiple R	% of Variance	F^5
1	Addition	D	.72*	52	$F_{33} = 7.18$
2	Subtraction	D	.65*	42	$F_{63} = 9.43$
3	Multiplication	D	.82*	67	$F_{48} = 19.96$
4	Division	D	.81*	65	$F_{63} = 23.43$
5	Addition	E	.82*	68	$F_{35} = 14.64$
6	Subtraction	E	.65*	42	$F_{43} = 6.30$
7	Multiplication	E	.80*	64	$F_{44} = 15.82$
8	Division	E	.84*	71	$F_{30} = 14.66$

*Significant at .01 level

To describe the criterion variance accounted for by the variables used in computing multiple R, the multiple R is squared. Therefore, 71% of the variance of the number of days required to master E division is explained by the five types of information which a teacher has at her disposal prior to writing a prescription. The variance for each unit can be found in Table 14. It is interesting to note that the generalizations used for computing the multiple R of the E addition, D and E multiplication, and D and E division accounted for more variance in terms of the factors than they did at the D addition and D and E subtraction levels. At both levels of subtraction, 42% of the variance of the criterion was being explained by the variables considered. Perhaps once the skills of addition and subtraction were mastered, the independent variables considered by the teacher were relied upon to a greater extent for prescription writing.

As stated previously, since beta weights are applicable to only specific regression equations, their usefulness was limited. It was not possible to compare the beta weight of a variable of one unit regression equation with the beta weight of other unit equations, even though the same predictors were used. To make comparisons, a more stable correlation for each variable was required. For this purpose a structure R was computed for each variable. Structure R is the correlation between each of the predictor variables and the multiple R with which it is associated. Table 15 shows the structure R of each of the variables for the units studied.

Table 15
Structure R

Unit	Unit Pretest Score	Number of Skills to Master	I. Q.	Age	Units Previously Mastered
D Addition	-.47	.67	.10	-.73	.46
D Subtraction	-.65	.66	.27	-.79	.08
D Multiplication	-.62	.87	.46	-.59	.42
D Division	-.95	.88	-.20	-.41	-.15
E Addition	-.82	.83	-.21	-.35	-.47
E Subtraction	-.90	.79	.12	-.62	-.28
E Multiplication	-.86	.75	.20	-.76	-.42
E Division	-.93	.96	-.09	-.35	-.34

As expected, the structure R's indicated that the correlation of pretest scores and days to master a unit correlated negatively with the multiple R's of the units or as the pretest score increased, the days to master the unit decreased. With respect to the variable unit pretest score, the D division unit at -.95, the E subtraction unit at -.90, and the E division unit at -.93 exhibited almost a perfect negative relationship between the criterion correlations and the multiple R's. At the D level of addition, the lowest structure R correlation for this factor was found to be -.47. Examining the correlations associated with the number of skills to master showed a positive relationship with the unit multiple R's. The range of structure R correlations for this variable was small, from .66 to .96, but all were highly significant. The correlations of the variable IQ exhibited inconsistent direction from unit to unit, and even though a wide range existed from .46 for D multiplication to -.21 for the E addition unit, none of the structure R's were considered high. An examination of the age correlations showed that the range varies from a low of -.35 for E division to a high correlation of -.79 for D subtraction. In all units as the age criterion correlation increased, the correlation with the multiple R decreased. Upon inspecting the structure R's of the factor units previously mastered, a wide range of correlations was found, from .46 for D addition to -.47 for E addition; however, none of the correlations was considered to indicate a high relationship between the criterion correlation and multiple R.

Discussion

From the above results, it can be concluded that the number of days a student requires to master a given unit is related to the student's initial entering stage; in particular, the student's unit pretest score, number of skills to master, and the student's age seem to be important factors. These results are consistent with what would be anticipated, since both unit pretest scores and the number of skills required to be mastered

are indicators of the amount of work a student must successfully complete before the unit is mastered and would logically be considered important factors influencing the amount of time required. Lack of correlation with IQ supports earlier findings that IQ is not an important factor in making progress in IPI as long as the student is capable of mastery. A possible interpretation of this finding is that the IPI system accommodates all levels of student intelligence.

Although the beta weights associated with variables change in relationship to the particular unit under discussion, further study should be pursued to examine the relative stability of these weights over successive years for a given unit. In addition, careful study should be made of the prescription writing process itself to determine what other factors affect the amount of time required by a student to master a particular unit of work. If other factors cannot be identified, this would suggest that consideration be given to using the five factors discussed in this study for monitoring student progress. Since the IPI system permits students to proceed at their "own rates," an index generated from these five factors could serve as a guide for identifying students who, in relationship to other students with similar characteristics, are spending an excess amount of time on a particular unit. This index would provide one more means for assessing relative student progress.

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